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## THE ANURA OF ITHACA, N. Y.: A KEY TO THEIR EGGS.

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For the last four years the writer has been studying the life-histories of the Anura of Ithaca, N. Y., but it will be some time before the work reaches completion. It seems best, however, to present the following brief summary of one phase of the work, in the hope that it may be of help to the numerous workers who employ Anuran eggs either for comparative or experimental embryologic purposes.

Eight species of Anura are found at Ithaca, N. Y., namely : *Rana sylvatica*, *Hyla pickeringii*, *Rana pipiens*, *Bufo lentiginosus americanus*, *Rana palustris*, *Hyla versicolor*, *Rana clamitans* and *Rana catesbeiana*.

The first five species appear from hibernation and spawn under a maximum air temperature of 43°–50° F. ; the last three delay until the maximum reaches 70° F. or more. The first five usually breed from the last of March until the middle of June ; the last three, from the last of May into August. All but two species, *Bufo l. americanus* and *Rana clamitans*, occupy four or five weeks for the spawning period. The exceptions may require two or three months. The number of eggs in a complement varies from 800 in *Hyla pickeringii* to 20,000 in *Rana catesbeiana*.

The eggs of three species, *Hyla versicolor*, *Rana clamitans* and *Rana catesbeiana*, float more or less at the surface of the water ; the eggs of the other five are submerged. The five species with submerged eggs are first to breed. They deposit eggs with firm jelly envelopes, several eggs appearing at an emission except in *Hyla pickeringii*, where only one appears at an emission. The three with buoyant eggs breed after May 25. They deposit at the surface masses or films of eggs with loose jelly envelopes, several eggs being deposited at an emission.

At the outset the attempt to secure fruitful mating with captive specimens was abandoned. The effort was rather to obtain pairs

already mated in nature. These were usually captured on night trips and were immediately taken to the laboratory, By the next morning an egg complement was ordinarily recorded. In this way a check was established upon the identification of eggs deposited in nature.

The measurements are based on fresh eggs none of which is beyond the fine morula stage. The color characters of the vitellus were taken at the time of oviposition with 7 species and not later than 6 or 8 hours after oviposition with the other species. A summary of the egg characters of each species follows in the accompanying key :

#### KEY TO THE EGGS OF ITHACA ANURA.

- A. A single row of eggs within a long spiral string of jelly looped about plant stems, sticks or resting upon the bottom ; vitellus diameter 1.0-1.4 mm.; inner envelope diameter 1.6-2.0 mm.; outer envelope diameter 3.4-4.0 mm. Egg complement, 4,000-7,000. Season at Ithaca, April 20-July.....*Bufo lentiginosus americanus*.
- AA. Deposited singly or in a mass.
  - B. Deposited in a firm consistent mass enveloping grass stems, twigs, etc., or free ; submerged ; often 15-20 bunches within an area of a few square feet.
  - C. Small distinct inner envelope evident to the naked eye, 2.3-3.0 mm.
    - D. Vegetative pole yellow ; animal pole brown ; mass globular ; vitellus 1.6-1.9 mm.; outer envelope, 3.6-5.0 mm. Egg complement, 2,000-3,000. Season, April 25-May 15.....*Rana palustris*.
    - DD. Vegetative pole white ; animal pole black ; mass plinth-like ; vitellus 1.6-1.8 mm.; outer envelope 4.2-6.0 mm. Egg complement, 3,500-4,500. Season, April 10-May 15.....*Rana pipiens*.
  - CC. Large inner envelope apparently absent, evident only under the lens, 3.6-5.8 mm.; vitellus 1.8-2.4 mm.; outer envelope 5.2-9.4 mm.; mass globular ; vegetative pole white ; animal pole black. Egg complement, 2,000-3,000. Season, April 1-30.....*Rana sylvatica*.
- BB. Deposited not in a hard consistent mass.
  - C. In small bunches or attached singly ; vitellus, .9-1.2 mm.
    - D. Outer envelope loose, 4.0-7.8 mm.
      - E. Inner envelope, 1.6-2.0 mm.; vegetative pole yellowish ; in small bunches (4-25) usually floating at the surface of the water, either attached to vegetation or free ; outer envelope, 4.0-6.0 mm.; vitellus, 1.1-1.2 mm. Egg complement, 1,500-2,000. Season, May 20-July 1.....*Hyla versicolor*.
    - EE. No inner envelope ; vegetative pole white ; in bunches (20-100) usually attached beneath the surface of the water ; outer envelope usually 5.0-7.8 mm., rarely 3.0 mm.; vitellus .9-1.2 mm. Egg complement, 500-800. Season, March 20-April 15.  
*Chorophylus triseriatus*.<sup>1</sup>
  - DD. Outer envelope firm, 1.4-2.0 mm.; vegetative pole never yellow ;

<sup>1</sup> Introduced at Ithaca in April, 1909.

single or in small bunches (4-12) attached to grass beneath the surface of the water; vitellus, .9-1.1 mm. Egg complement, 800-1,000. Season, April 5-May 10.....*Hyla pickeringii*.

CC. In large loose masses; vegetative pole white; animal pole black; vitellus, 1.2-1.7 mm.; at or near the surface of the water.

D. Usually one continuous film, 1-2 eggs thick, on the surface of the water, the film's diameter being seldom 1 foot; inner envelope distinct, 2.8-4.0 mm.; egg mass usually attached or amongst vegetation. Egg complement, 3,500-4,500. Season, May 25-August 10.

*Rana clamitans*.

DD. Either a film 1-2 1/2 feet in diameter or a stringy frayed widespread mass; attached to twigs or sticks; almost invariably amongst brush and at or near the surface of the water; no inner envelope. Egg complement, 12,000-20,000. Season, June 20-July 25.

*Rana catesbeiana*.